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Engineering Design File

ROD Amendment Cost Estimate Support Data Recapitulation

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

INEEL
Idaho National Engineering & Environmental Laboratory
BECHTEL BWXT IDAHO, LLC

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1. Project File No. 6223-AD 2. Project/Task WAG 1/ OU 1-07B/ Rod Amendment

3. Subtask _____

4. Title: ROD Amendment Cost Estimate Support Data Recapitulation

5. Summary: A cost estimate has been performed for the two proposed alternatives described in the "ROD Amendment for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action." Alternative 1 was pump-and-treat of the hot spot, the medial zone, and monitored natural attenuation of the distal zone. The total project cost was $43 Million for Alternative 1 and $35 Million for Alternative 2. This total cost was based on the net present value with a discount rate of 7%.

6. Distribution (complete package):

Distribution (summary package only):

7. Review (R) and Approval (A) Signatures: (Minimum reviews and approvals are listed. Additional reviews/approvals may be added as necessary.)

	R/A	Printed Name	Signature	Date
Author	R	Lee O. Nelson		9/11/01
Independent Verification	R/A	Joseph S. Rothermel		9/10/01
Project Manager	R/A	Bradley J. Frazee		9/10/01

CONTENTS

ACRONYMS

ASTU	Air Stripper Treatment Unit
D&D	decontamination and dismantlement
DPTU	Dissolved Phase Treatment Unit
FDR	Field Demonstration Report
FY	fiscal year
GWTF	Groundwater Treatment Facility
ISB	In Situ Bioremediation
ISCO	In Situ Chemical Oxidation
MNA	monitored natural attenuation
NGWTF	New Groundwater Treatment Facility
NPTF	New Pump and Treat Facility
NPV	net present value
OU	operable unit
P&T	pump & treat
RAWP	Remedial Action Work Plan
RD/RA	Remedial Design/Remedial Action
ROD	Record of Decision
SOW	Statement of Work
TAN	Test Area North
WP	Work Package

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Estimator:	J. D. Folker
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File:	6223-AD
Approved By:	

I. SCOPE OF WORK:

This cost estimate covers the following two remediation alternatives for the Test Area North (TAN) Final Groundwater Remediation, Operable Unit (OU) 1-07B:

- Alternative 1—Pump and Treat (P&T) of the Hot Spot, the Medial Zone, and the Distal Zone.

- Alternative 2—In Situ Bioremediation (ISB) of Hot Spot, P&T of the Medial Zone, and Monitored Natural Attenuation (MNA) of the Distal Zone.

These two alternatives are the result of the completion of treatability studies conducted in accordance with the original 1995 1-07B Record of Decision (ROD). The OU 1-07B Field Demonstration Report (March 2000) identifies ISB and MNA as being more effective than the P&T remedy identified in the 1995 ROD for two areas of the contaminant plume: the hot spot and the distal zone. Alternative 1 represents the original 1995 ROD remedy, while Alternative 2 represents modification to the original remedy to replace P&T in the hot spot and distal zones, with ISB and MNA respectively.

This planning estimate provides an estimate of the total life cycle cost for each alternative. The time frame represented is from preparation of the original Remedial Design/Remedial Action (RD/RA) Statement of Work (SOW) in 1995 through 2030. The estimate for both Alternative 1 and Alternative 2 utilizes actual costs for the time frame from 1995 through fiscal year (FY) 1999. The estimate for each alternative then uses estimated costs for FY 2000 through FY 2030. The estimated time frame costs are estimated in current year (FY 2000) dollars with total life cycle cost for each alternative being identified as the actual cost through FY 1999 plus the estimated cost from FY 2000 through FY 2030.

In addition, net present value (NPV) costs are calculated for each alternative. This NPV cost includes actual costs through FY 1999 plus estimated costs from FY 2000 through FY 2030. The NPV calculation is applied only to the estimated cost time period. The NPV is calculated by using an overall discount rate of 7% per year.

A summary of the scope for each alternative is described below: the estimated time frame for implementing the scope for each alternative is provided in Appendix A and B. The Summary Schedule for Alternative 1 and 2 is shown in Appendix C and D.

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I.A Alternative 1—Pump and Treat of the Hot Spot, the Medial Zone, and the Distal Zone.

This alternative represents the original P&T remedy as identified in the 1995 ROD and as modified in the 1997 Explanation of Significant Differences. This alternative is based on the assumption that treatability studies do not identify any alternate technology to be more effective than P&T. The summary level scope for FY 2000 through FY 2030 for this alternative is:

- Project Management
- Treatability Studies—Field Demonstration Report (FDR) #1, In Situ Chemical Oxidation (ISCO) Field Evaluation, MNA Field Evaluation, FDR #2.
- New Groundwater Treatment Facility (NGWTF)—Design and Construction of a NGWTF for the hot spot.
- New Pump and Treat Facility (NPTF)—Construction of a NPTF for the medial zone.
- Dissolved Phase Treatment Units (DPTUs)—Design and construction of the two DPTUs for the distal zone.
- Performance Monitoring Wells—Design and construction of performance monitoring wells for the hot spot, medial zone, and distal zones.
- Remedial Action Work Plan (RAWP)—Revision to the Phase C RAWP and supporting documents to address the NGWTF and DPTUs.
- Phase B Hot Spot Containment—Continued operation of the existing hot spot Groundwater Treatment Facility (GWTF) or Air Stripper Treatment Unit (ASTU) until the NGWTF is operational.
- Phase C Operations—Operation and maintenance of the NGWTF, NPTF, and DPTUs for hot spot containment and dissolved phase treatment.
- Surveillance and Monitoring—Groundwater monitoring and remedy performance monitoring including 5 year reviews.
- Operations and Maintenance Report
- Decontamination and Dismantlement (D&D)—D&D of the GWTF, ASTU, NGWTF, NPTF, and DPTUs. Abandonment of monitoring and remediation wells.

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I.B Alternative 2—In Situ Bioremediation of Hot Spot, Pump and Treat of the Medial Zone, and Monitored Natural Attenuation of the Distal Zone.

This alternative represents the new proposed remedy as identified in the 1-07B FDR (March 2000). This alternative is based on the conclusion in the Functional Design Requirement that ISB and MNA are more effective than P&T in the hot spot and distal zones, respectively. The summary level scope for FY 2000 through FY 2030 for this alternative is:

- Project Management
- Treatability Studies—FDR #1, ISB treatment system pre-design operations.
- Proposed Plan and ROD Amendment
- RD/RA SOW —New or revised RD/RA SOW
- ISB Treatment System—Design and construction modifications for an ISB treatment system for the hot spot.
- NPTF—Construction of a NPTF for the medial zone.
- Performance Monitoring Wells—Design and construction of performance monitoring wells for the hot spot, medial zone, and distal zones.
- RAWP—Revision to the Phase C RAWP and supporting documents to address the ISB Treatment System and MNA.
- Phase B Hot Spot Containment—Continued operation of the existing ISB treatment system and ASTU until the modified ISB treatment system is operational.
- Phase C Operations—Operation and maintenance of the ISB Treatment System and NPTF for hot spot and medial zone treatment.
- Surveillance and Monitoring—Groundwater monitoring and remedy performance monitoring, including 5 year reviews.
- Operations and Maintenance Report
- D&D—D&D of the GWTF, ASTU, ISB Treatment System and NPTF. Abandonment of monitoring and remediation wells.

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II. BASIS OF THE ESTIMATE:

This estimate includes drawings, design reports, engineers notes and/or other documentation upon which the estimate originated and are shown as follows:

a. Alternative 1 & 2, Summary Work Breakdown Structure with actual costs through 1999.

b. ROD Alternative Cost Estimate Input, Phase B Treatability Studies.

c. ROD Amendment, Ground Water Monitoring Cost Estimate.

d. ROD Alternatives, Treatability Study Estimate Summary.

e. Operating Cost Estimate at New GWTF by Joint Control Group dated 08-26-99 & 08-25-99.

f. Construction Costs at New GWTF by Joint Control Group dated 08-26-99.

g. OU 1-07B, TAN Final Ground Water Remediation. Work Package (WP)-16-DPTU. Planning Estimate File #6223-S.

h. OU 1-07B, TAN Final Groundwater Remediation WP 10, Ground Water Monitoring FY 2000. WP Detail Estimate File # WP 10.

i. WP-11, ISCO Summary Costs FY 00, 01.

j. WP-11, Natural Attenuation Summary, FY 00, 01.

k. WP-11, Functional Design Requirements Summary FY 00, 01.

l. WP-9, NPTF/ISB. FY 03 to FY 30 Facility Operations Costs.

m. WP-9, NPTF Operations FY 01 to FY 02 Facility Operations.

n. WP-5, NGWTF, NPTF & DPTU's FY-00 to FY-30.

o. Preliminary NGWTF 10% Remedial Design, TAN, OU 1-07B (DRAFT).

p. Preliminary ISB 10% Remedial Design, TAN, OU 1-07B (DRAFT).

q. WP-7 Hot Spot Containment, ASTU FY 01, 02, 03 Facility Operations

r. D&D Estimate Models for CFA-603

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III. ASSUMPTIONS:

Assumptions are condition statements accepted or supposed to be true without proof of demonstration. An assumption has a direct impact on total estimated cost.

- Alternative 1: Construction of 2 DPTUs required for P&T for the distal zone.
- Alternative 1 & 2: Monitoring complete in 2030.

IV. CONTINGENCY GUIDELINE IMPLEMENTATION:

The percentage used for contingency as determined by the contingency allowance guidelines can be altered to reflect the type of construction and conditions that may impact the total estimated cost. A contingency of + 50%/- 30% is applicable to estimated costs per DOE cost estimating guidelines. The contingency has not been included with total project costs.

V. OTHER COMMENTS/CONCERNS SPECIFIC TO THE ESTIMATE:

V.A.1 Scope

This task covers project management activities for implementing the TAN Groundwater Remediation Project. Scope under this task includes project planning, baseline development, project execution, project performance monitoring and reporting, and baseline management. Project planning includes scope development, schedule development, and activities duration and cost estimating. Currently, annual project planning is at a detailed work package level. It will remain at this level for the next two years of the project scope with a planning level to be initiated thereafter. Project execution includes detailed planning for task implementation and work authorization and control. Performance monitoring includes tracking schedule and cost status, performance measurement and corrective action development, and providing monthly performance reporting and estimates to complete. Baseline management includes scope management and change control to ensure work is performed within the project baseline.

The scope under this task also includes project integration support of the Department of Energy Idaho Operations Office in regular weekly conference calls and quarterly meetings with the Environmental Protection Agency and Idaho Department of Health and Welfare in order to meet the requirements of the Federal Facility Agreement and Consent Order (FFA/CO).

The general scope of this task for Alternative 1—P&T and Alternative 2—ISB, P&T, and MNA is the same. The level of project management during RD/RA SOW development and RD/RA Construction is estimated at a higher level than during Remedial Action Operations.

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V.A.2 Schedule

The schedule for this task runs from 1995 to 2030. The total estimate includes actual cost through FY 1999 and estimated cost from FY 2000 through FY 2030. See Appendix A and B for the summary schedule for each alternative.

V.A.3 Cost Basis

The following information is based on actual resources and costs experienced on the project from FY 1995 through FY 1999.

Resources for this task include the following:

- Waste Area Group 1 PBS Manager
- Waste Area Group 1 Project Engineer
- Project Manager
- RD/RA Manager
- Project Engineer
- Project Controls Engineer
- Cost Estimator
- Administrative Support

Appendix C provides the Life Cycle Analysis for Alternative 1 and 2, while Appendix D provides a more detailed Cost Summary Analysis by fiscal year for each alternative.

V.A.3.a Alternative 1—Pump and Treat

For Alternative 1, the project management continues at a steady level through FY 2003 in support of completion of ISB and ISCO field evaluations, design and construction of the NPTF, design and construction of the NGWTF, and design and construction of the DPTUs. The level of project management decreases significantly in FY 2004 when all three pump and treat systems are in operation and when D&D is performed on the GWTF and ASTU. From FY 2005 to FY 2030, project management is provided at a level appropriate for ongoing treatment system operations, biannual groundwater monitoring, and five year reviews beginning in FY 2005.

V.A.3.b Alternative 2—ISB, Pump and Treat, and MNA

For Alternative 2, the project management continues at a steady level through FY 2002 in support of completion of the ISB field evaluation, design and construction of the NPTF, and design and construction of the ISB Treatment System. The level of project management decreases significantly in FY 2003 when the NPTF and ISB systems are in operation and when D&D is performed on the GWTF and ASTU. From FY 2004 to FY 2030, project management is provided at a level appropriate for ongoing treatment system operations, biannual groundwater monitoring, and five year reviews beginning in FY 2005.

V.B WBS1.2 Treatability Studies

V.B.1 Scope

This task covers planning and implementation of treatability studies on five innovative technologies in accordance with the OU 1-07B ROD. The technology evaluation is conducted using a three step process that includes (1) initial evaluations, (2) lab studies, and (3) field evaluations. As of September 1999, evaluations were completed on two of the technologies including metal enhanced reductive dechlorination and grout. Field evaluations were implemented for MNA and ISB. Design of a field evaluation was completed for ISCO, but the decision to perform the ISCO field evaluation was dependent on the success of the ISB field evaluation.

The general scope for all treatability studies includes technical integration of technological evaluation activities, development of work plans for lab studies and field evaluations, conducting lab studies, design and construction for field evaluations, operations of treatment systems for field evaluations, well design and construction, sampling and analysis during field evaluations, and data analysis and reporting of lab and field evaluation results. The scope also includes preparing field demonstration reports to summarize the results of the technological evaluations and to recommend and facilitate agency decisions based on the results of the field evaluations.

The scope of this task for Alternative 1—P&T and Alternative 2—ISB, P&T, and MNA varies based on the outcomes of the technological evaluations. Alternative 1 assumes that none of the alternate technologies are determined to be more effective than the base case pump and treat remedy. Alternative 2 is based on ISB and MNA being determined to be better than the base case pump and treat remedy for the hot spot and distal zone, respectively.

- Alternative 1—For this alternative, field evaluations are conducted for ISB, ISCO, and MNA. Field evaluation reports are prepared for ISB and ISCO. The ISCO field evaluation follows the ISB field evaluation at the hot spot and two FDR are prepared. The first FDR documents the results of the ISB field evaluation, the earlier decisions on metal enhanced

reductive dechlorination and grout, and provides a status on the MNA field evaluation. A second FDR documents the results of the ISCO and MNA field evaluations.

- Alternative 2—For this alternative, field evaluations are conducted for ISB and MNA. One FDR is prepared documenting the results of both the ISB and MNA. Based on the results of the field evaluations, no second FDR is necessary and the ISCO field evaluation is not performed. A proposed plan and ROD amendment are prepared to implement the agency decision in the FDR for ISB and MNA.

V.B.2 Schedule

- Alternative 1—The ISB field evaluation is finished in early FY 00. The first FDR is prepared and submitted in FY 00. The ISCO field evaluation is conducted from second quarter FY 00 through the first quarter FY 01. The MNA field evaluation continues during FY 00 and is completed in FY 01. The second FDR is prepared and submitted in FY 01.

- Alternative 2—The ISB field evaluation is finished in early FY 00 but continues during FY 00 as a pre-design optimization activity. The MNA field evaluation is also finished in early FY 00 but also continues during FY 00 as an interim activity. The FDR is prepared and submitted in early FY 00. A proposed plan and ROD amendment are prepared in FY 00. The ROD is finalized in FY 01.

V.B.3 Cost Basis

The tasks and cost basis described below are based on planning performed in FY 99 and FY 00. This information is also based on actual resource needs and costs experienced on the project from FY 1995 through FY 1999. Cost basis information is provided below. For the majority of the tasks identified below, detailed cost estimates were previously developed and have been utilized in this planning estimate.

V.B.3.a Alternative 1—Pump and Treat

a. ISB Technical Integration—Technical integration during preparation of the field evaluation report in FY 00.

b. ISB Field Evaluation Report—Preparation of the field evaluation report in FY 00, documenting the results of the ISB field evaluation performed in FY 99.

c. ISCO Technical Integration—Technical integration during the performance of the ISCO field evaluation in FY 00.

d. ISCO Field Evaluation—The field evaluation, to be conducted in FY 00, includes the scope as described in the ISCO Field Evaluation Work Plan, November 1999. These activities include: (1) pre-ISCO baseline sampling, clean water flood, and tracer test, (2) ISCO treatment system construction, startup, and pre-final inspection, and (3) performance of the ISCO field evaluation, including an optimization phase and a validation phase.

e. ISCO Field Evaluation Report—Preparation of the Field Evaluation Report in late FY 00, documenting the results of the ISCO field evaluation performed in FY 00.

f. MNA Technical Integration—Technical integration during the performance of the MNA field evaluation in FY 00.

g. MNA Vertical Profile Sampling—Vertical profile sampling in FY 00 and FY 01 in accordance with the Groundwater Monitoring Plan.

h. MNA Data Analysis and Site Conceptual Model Update—Data review and analysis from groundwater monitoring in FY 00. Preparation of update to Site Conceptual Model in FY 00.

i. MNA Monitoring Wells—Design, construction, and development of three new monitoring wells in FY 00. Sampling and analysis of the P-Q inter-bed during the drilling of the three new monitoring wells in FY 00. Preparation of Well Completion Report for monitoring wells. Well site reseeding and access road graveling.

j. MNA Modeling—Perform modeling to support MNA field evaluation.

k. FDR #1—The first FDR documents the results of the ISB field evaluation, the earlier decisions on metal enhanced reductive dechlorination and Grout, and provides a status on the MNA field evaluation. This FDR is prepared in FY 00.

l. FDR #2—The second FDR documents the results of the ISCO and MNA field evaluations. This FDR is prepared in FY 01.

m. Treatability Studies Technical Integration—Technical integration during the preparation of the second FDR in FY 01.

V.B.3.b Alternative 2—ISB, Pump and Treat, and MNA

a. ISB Technical Integration—Technical integration during ISB pre-design activities in FY 00 as listed below.

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b. ISB Field Evaluation Report—Preparation of the field evaluation report in FY 00, documenting the results of the ISB field evaluation performed in FY 99.

c. ISB Modeling—Modeling for process optimization performed in FY 00.

d. ISB Pre-Design Optimization—ISB treatment system pre-design operations monitor electron donor persistence and distribution in FY 00.

e. ISB Alternate Electron Donor Evaluation—Perform an alternate electron donor evaluation lab study.

f. ISB Design Optimization Work Plan—Preparation of the ISB Design Optimization Work Plan in FY 00 as described in the FDR to cover continuation of ISB treatment system operations and support further information gathering for the final ISB treatment system design.

g. ISB Performance Monitoring Strategy Development—Performing a data quality objective process to develop the performance monitoring strategy for ISB at the hot spot.

h. MNA Technical Integration—Technical integration during the performance of the MNA field evaluation in FY 00.

i. MNA Vertical Profile Sampling—Vertical profile sampling in FY 00 and FY 01 in accordance with the Groundwater Monitoring Plan.

j. MNA Data Analysis and Site Conceptual Model Update—Data review and analysis from groundwater monitoring in FY 00. Preparation of update to Site Conceptual Model in FY 00.

k. MNA Monitoring Wells—Design, construction, and development of three new monitoring wells in FY 00. Sampling and analysis of the P-Q inter-bed during the drilling of the three new monitoring wells in FY 00. Preparation of Well Completion Report for monitoring wells. Well site reseeding and access road graveling.

l. MNA Modeling—Perform modeling to support MNA field evaluation.

m. MNA Performance Monitoring Strategy Development—Performing a process to develop the performance monitoring strategy for MNA in the distal zone.

n. FDR—One FDR is prepared, documenting the results of both the ISB and MNA.

o. Proposed Plan and ROD Amendment—A proposed plan and ROD amendment are prepared to implement the agency decision in the FDR for ISB and MNA.